Components and Middleware

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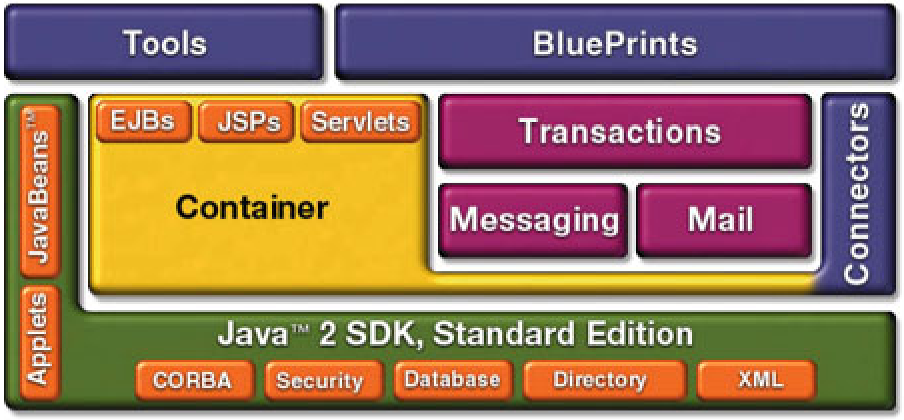
Architectures and Frameworks



J2EE

Image from java.sun.com/j2ee

- Component architectures will prevail for years
  - Massive middleware substrate
  - Simplified application programming
    - Frameworks, scripting, IDEs
  - Strong separation of development roles/tasks

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Middleware Challenges

- Productivity and quality come at high cost
  - Ever slower and more bloated systems
    - Example: RPC → RMI → SOAP
  - Continuing need for better algorithms & designs
    - persistence, security, protocols, concurrency control, fault tolerance, VMs, reactive event handling, ...
- Expanding realm of supported applications
- New Compositional & Architectural issues
  - Moving from: How to do it at all
  - To: How to make it fast/small/scale

Quality of Service Challenges

- QoS becoming intrinsic to systems
  - Convergence of RT and enterprise systems?
  - Multimedia, telecom, time−dependent protocols
- Usually requires bounded latencies
  - Also memory, bandwidth, IO, ... guarantees
- Must reconcile with opportunistic designs
  - Systems optimize for high average throughput
    - Processors, caches, networking, concurrency, IO, GC, dynamic compilation and loading, ...
  - But have high variances
    - Three orders of magnitude not uncommon

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Research Process

- Need open research platforms
  - Avoid ramp−up obstacles, facilitate collaboration and tech−transfer
- Need balance among
  - Formal analysis
  - New designs, algorithms, protocols
  - Empirical analysis
  - Proof of concept implementations
  - Usable systems